White Paper

FacilityOT
YOUR GATEWAY TO OPERATIONAL TECHNOLOGY

Cloud-BAS FacilityOT Platform

The "Plug and Control" Platform for Operational Technology

FacilityOT North America
September 2022

Gateway Models FOT-C and FOT-C/IoT

FacilityOT's Cloud-BAS/IoT Platform

THE "PLUG AND CONTROL" PLATFORM FOR BUSINESS OPERATIONAL TECHNOLOGY

Introduction

Is your business still relying on manual methods to check facility operations? Sending staff or contractors out at night to make sure all the exterior security lights are working? Visually inspecting hot water heaters for leakage? Testing standby power generators? Spending hundreds of dollars having HVAC techs show up just to change a setting on the thermostat? Or using a handheld thermometer to read the temperature of refrigerated areas? If so, chances are you may be missing important cues to take immediate action before problems become catastrophic and expensive to repair or recoup losses.

We have only scratched the surface of what these emerging technologies can do.

To remain competitive and in compliance with regulatory requirements in an era of less staff and lower operating budgets, more and more businesses are embracing new operational and safety solutions comprised of various "smart" technologies—Building Automation Systems (BAS), Building Management Systems (BMS), Internet of Things (IoT) devices, Artificial Intelligence (AI), Operational Technology (OT) networks, and cloud computing…among others. But up until now, only the most tech-savvy businesses have been able to fully tap into the financial and carbon reduction rewards of these emerging technologies.

This white paper presents the latest, most innovative, cloud-based OT solution on the market today for monitoring, controlling, and reporting with respect to building operational elements needed by all types of business locations, focusing on: 1) bank branches, 2) convenience stores, 3) retail stores, 4) office buildings, and 5) service centers, including fire stations, post offices, pharmacies, urgent care, eye care, motor vehicle administration offices, gas stations, gyms, hair salons, etc.

Enter the Cloud

The days of installing onsite computers to support building automation systems are over.

It was not until the cloud became accepted by building owners and operators, in early 2019, as a trusted option with end-to-end security that cloud-based control and monitoring system platforms could really take a firm hold, allowing low-cost building management and incorporation of IoT devices, AI, OT networking, and Software-as-a-Service (SaaS) to become a reality.

The beginning of anywhere, anytime access to monitor/control data via a smartphone or tablet meant that unlimited OT data from several locations could be stored and processed in the cloud and seen by authorized individuals, to not only monitor and control a single building or store but be able to see what was happening at 1,000s of their locations. The implications are enormous, as historical data can now be

maintained, trended, and analyzed, not to mention a multitude of automated control, monitoring, reporting, and alert/alarm capabilities.

With Technology Comes Data

Any cloud-based platform used to support your business OT requires a path (communication network) from the technology provisioned site to the cloud computing/software environment. The key is how to safely get it there. For years, operational solutions, such as BAS, have utilized the firm's Information Technology (IT) network for transporting operational data to an in-house computer. With practically all businesses turning to cloud technology (including Wi-Fi devices), each service provider must be carefully vetted to reduce any potential IT security risks!

Applying OT to your IT network may subject your business network to malware, ransomware, spying, and virus intrusions, as most IT networks are not equipped to safely support OT data. Furthermore, in today's security-conscious climate, most IT departments no longer allow any type of OT device to be connected to their IT networks. A solution that eliminates an IT connection altogether should be one of the highest considerations when making your digital technology transformation decisions.

Choosing the wrong technology provider could potentially create an absolute IT security nightmare for your business.

The FacilityOT Cloud-BAS Difference

Over the decades, the term "solution" has meant many different things for building system control and management. A decade ago, an electrically operated time clock to turn on parking lot lights at 8:00 pm and off at 7:00 am was a solution. A few years later, an HVAC thermostat that could automatically adjust the heating temperature 5 degrees lower at night was a solution. Years later, building control systems that could control and monitor several mechanical systems within a facility using a computer was a solution. More recently, building management systems comprised of several "self-contained" (individual) solution elements create a solution. Although better than the past solutions, unfortunately, many of these newer "smart" element solutions still have their own data configuration and likely operate on separate cloud platforms that each require separate web access, and generally have little or no data sharing capacity.

Until now, obtaining a truly "holistic" solution has been nearly impossible. However, more sophisticated technology is changing the way commercial buildings function for facility owners, managers, and even occupants. Today, an IoT-enabled BMS coupled with "smarter" data analytics provides unprecedented insight into a building's equipment, maintenance, air quality, energy use, and systems integration.

For an OT platform to be truly comprehensive, an array of IoT, BAS, AI, and cloud-to-cloud technologies are needed to deliver a single, holistic solution.

FacilityOT (FOT) North America has leveraged all of the emerging digital capabilities and, in addition, spent years researching the best sensor technologies on the market, to bring forth the ultimate BAS solution possible on a single platform. Instead of having to identify different vendors for each type of sensor by yourself, we did the homework for you! The Cloud-BAS platform uses cloud computing together with automatically updated cloud-hosted software, a bundle of sensors for the most common facility

monitoring needs, and a single control box that receives the measurements from wired or wireless devices and transmits that data to the Internet. A user-friendly dashboard lets you see the status of everything you choose to monitor or control (literally, the Internet of Things – IoT) in real time from a mobile phone or tablet 24/7/365.

That's the high-level description. Now, let's look at a more detailed description of this innovative technology solution.

How it Works

The "Plug and Control" Cloud-BAS platform significantly reduces the human resource element by fully automating the measurement and diagnosis of electric power consumption and/or loss, HVAC, refrigeration/freezers, interior and exterior lighting, company signage, water consumption, sump pump failure, sewage injector pump status, occupancy levels, emergency power generator operation status, floods, water leak detection, propane tank levels, power generator fuel levels, parking garage vehicle exhaust fumes, water heater failures, water pressure loss, fire protection status, ambient temperature and humidity, indoor air quality, verification of cleaning crew and dumpster services…the list goes on. It also allows cloud-to-cloud connectivity for tapping into related databases, like weather forecasters and utility companies, which help optimize device settings and analyze trends, e.g. energy usage, leading to cost-saving adjustments.

OT, hardware, and controls automatically operate and monitor the operational "things" of buildings.

We have made it extremely easy to select the correct Cloud-BAS gateway solution, by prescribing pre-bundled control and sensor packages for each of the main business sectors it services, so that it is virtually ready to plug and control on Day 1. Customized orders with additional sensors and/or services can be requested to meet individual site specifications.

In addition to traditional wired sensing devices, we also include "wireless" sensors to cover those hard-to-reach areas that do not have a clear path to the Cloud-BAS gateway or where the cost of running cables is prohibitive; picture a large, outdoor parking lot that requires security lighting to be monitored by numerous sensors placed at far distances from the main building.

These sophisticated sensors and OT devices are specially designed to deliver accurate, continuous monitoring and control that help prevent facility operations from going wrong—whether you have one location or 10,000 geographically dispersed locations that must be managed. To meet this goal, our platform operates on a highly secure, encapsulated OT network path (as opposed to an IT network), through which data is sent directly to a private FacilityOT Cloud environment for end-to-end protection. The platform-created layer 3 PKI virtual private network (VPN) site-to-cloud connection uses RSA algorithms and ASE encryption that make this high level of cloud platform security possible.

Note: This white paper targets the Carrier i-Vu® brand of HVAC systems, with other brands discussed in their respective documents.

Carrier i-Vu® Provisioned Gateway Models

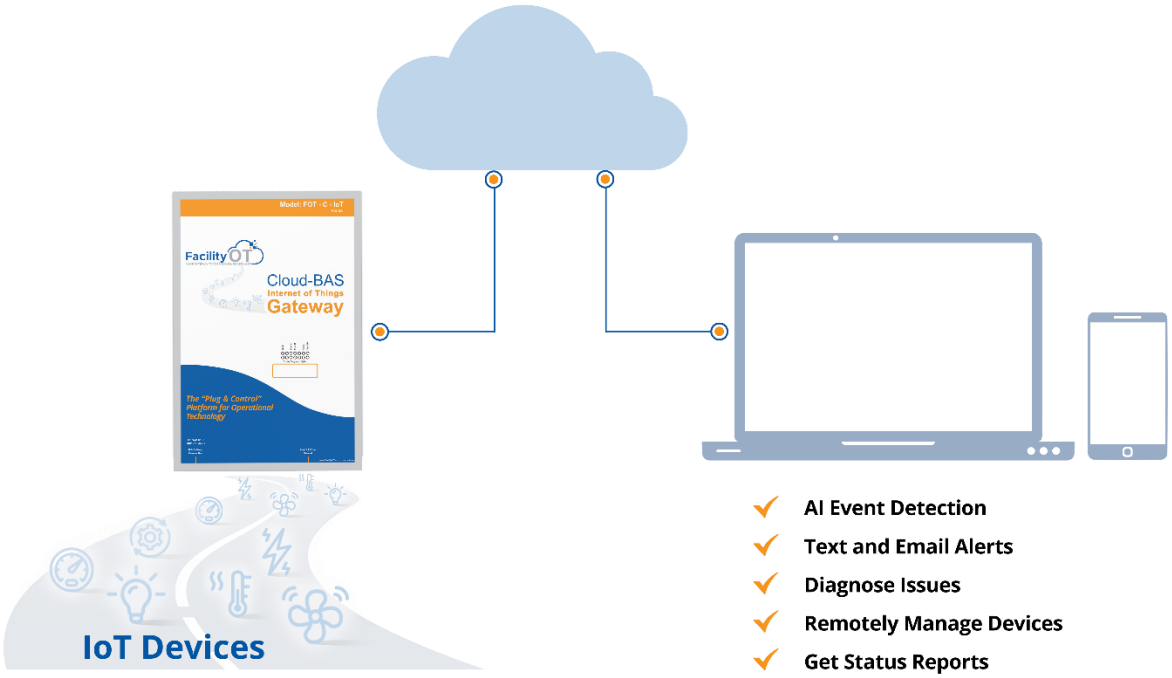
FacilityOT currently offers two different models of the Cloud-BAS Gateway for use with commercial Carrier HVAC systems:

- **FOT-C** – This standard model is installed onsite and natively connects with Carrier i-Vu enabled HVAC systems.
- **FOT-C-IoT** – This specialized model includes all the features of FOT-C, plus a variety of third-party IoT device integration capabilities.

No matter which gateway model is installed, the basic cloud monitoring features remain the same. Each Cloud-BAS Carrier i-Vu Gateway comes pre-provisioned, and boiler plated to operate within your specific type of OTN environment.

Packages include:

- Cloud-BAS i-Vu provisioned gateway
- i-Vu Pro software
- Graphic of equipment (floor plans at an additional cost)
- Alarming
- Trending
- Operational technology network
- One year of free web access



Refer to the *Cloud-BAS Carrier i-Vu® Data Sheet* for more details.

Addressing IT Security Concerns

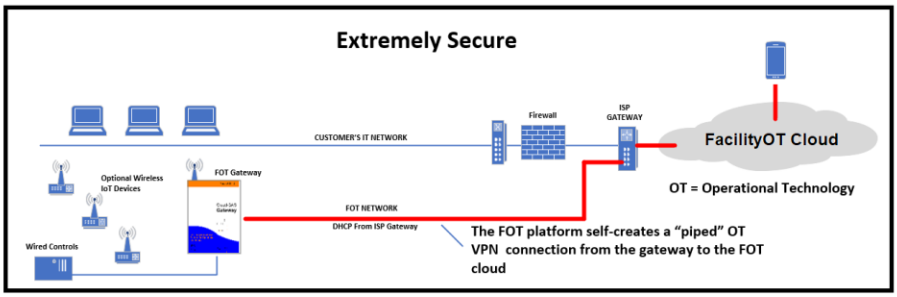
Limitations of the past

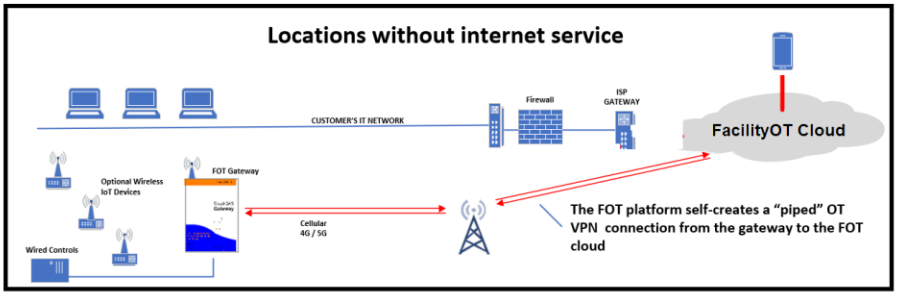
Building Automation Systems (BAS), also known as Building Management Systems (BMS), are not altogether new on the scene. However, until FacilityOT North America introduced its "next-generation" Cloud-BAS platform, software had to be manually loaded onto a local, dedicated computer that IT personnel installed and set up in order to control various electric, electronic, and mechanical systems throughout a building.

Traditional standalone setups, while capable of running and monitoring the operation of buildings (for example, maintaining temperatures, starting exhaust fans at a set time, and so forth), had no secure way to view data on the web or integrate data across multiple locations. They also required manual upgrades as the software was periodically enhanced. This left a lot to be desired in terms of efficiency, centralization, and IT/maintenance costs that kept rising to expand their reach. Access to remote, real-time facility data was needed to remain competitive, reduce operating overhead, and scale up to mitigate growing pains and consequential costs. A more effective way of connecting physical devices with digital interfaces was the answer, changing the way businesses plug into technology forever.

Added technology

Leveraging the traditional OT that was used to control building systems (HVAC, power, lighting, etc.), we have incorporated IoT technology, along with AI diagnostic capabilities, the power of the cloud, and our own wireless sensor devices, to deliver the most innovative and secure cloud-based BAS to date. No other company has sourced and integrated all these technologies into one offering that protects OT data apart from IT networks. And it all works together seamlessly to go beyond the limitations of the past with a fully automated, digital solution capable of expanding as your business needs grow.





Efficiency and uptime are key factors driving a continuous evolution of "smart" devices, AI, and controls requiring less human intervention. This Cloud-BAS platform offering is actually OT version 4.5, a step above what is touted as Industry Technology 4.0 (see Appendix B). Designed in collaboration with dozens

of OT manufacturers, it offers the highest degree of reliability with effortless installation and practical application to a wide range of businesses, while also ensuring a standardized outcome and a reduced carbon footprint. The days of expensive trips made by technicians to monitor and diagnose equipment are over; replaced by sensitive electronic diagnostics that supply significantly more detailed feedback. Keep reading to learn more about this streamlined plug-and-control platform that eliminates any reliance on IT services whatsoever.

Hardware & Software Installation

The Cloud-BAS FacilityOT platform is effortlessly installed, with minimum requirements. All you need is one control box (gateway) per building mounted on the wall, plus a set of sensors hand-picked by FOT engineers from our extensive catalog to operate your type of business. Regardless of the model, each gateway comes pre-programmed to match your specifications and is, thus, ready to simply plug and control. Using cloud-based SaaS further simplifies setup, as licensing of our application means no software installation, ever. Instead, automatic updates are transparently performed to ensure the software is refreshed as enhancements are made, at no extra cost. This streamlined hardware and software technology takes care of itself!

Unique Functions

Design considerations

FOT engineers have taken the following design factors into consideration when developing our products, as should any business when choosing a technology platform:

- Provide an OT network outside of any IT networking
- Incorporate many types of technologies into a single solution
- Support multiple time zones
- Customizable to suit specific operational requirements
- Allow 24/7/365 web access
- Easy to install and maintain
- Enable real-time data trending and reporting, as well as notifications
- Streamline operations, improve safety, and optimize efficiency of IoT devices

Sensors & connectivity

The Cloud-BAS platform offers a single-source, open solution that seamlessly communicates with a wide array of manufactured IoT edge devices and sensors, as well as Carrier HVAC controls.

The gateway receives information from the installed sensors (wired or wireless) before sending it to the private FacilityOT Cloud. Strategically placed sensors help with the following common building functions:

- Prevent property damage (water leaks)
- Make lighting and HVAC operations more efficient (motion and light levels, building air temperatures, etc.)
- Measure power usage and water usage
- Ensure property security with exterior night-time light monitoring

- Prevent product loss/damage by continuously monitoring temperature and humidity levels (i.e. reach-in refrigeration)

Artificial intelligence

FOT has created and added the "smart" technology layer to otherwise standalone "dumb" things and equipment. Through the use of AI and mathematical algorithms, it is possible to pre-program the Cloud-BAS gateway for different business sectors. AI also enables the remote diagnosis of problems, and with the assistance of machine learning (ML), causality (e.g. why something is out of range) and corrective actions can be identified and conveniently displayed on the user dashboard in real-time. For example, a freezer door may have been left open, which would drive temperatures higher and cause food to spoil; thus, triggering an alert. This automated feedback loop not only speeds up problem resolution but also takes the technician and associated costs out of the equation. Any person at the troubled location can simply shut the freezer door!

Features & Benefits

The Cloud-BAS platform provides the latest OT capabilities with the following innovative, cost-effective features and benefits to directly aid customers:

Main features include…	**Main benefits include…**
• Efficient, consistent management of all locations from one Cloud-BAS FacilityOT platform • Purpose-built FOT "plug and control" architecture • Single protocol language transmitted into the private FacilityOT Cloud (device-agnostic) • Interactive system with multiple types of sensors uploading data directly to the cloud • Easy-to-read, web-accessible dashboard available 24/7/365 from anywhere in the world • Expandable monitoring and controlling of OT devices as requirements change • Future-proof design, with updates automatically pushed from the FacilityOT Cloud to each site-installed gateway • Built-in AI, with diagnostics and user-configurable automatic alarms and alerts via text and/or email • Cloud-to-cloud connectivity to work in conjunction with national weather forecasts, analyze energy usage trends, etc. (add-on service) • Industry-specific packaged solution with single pane of glass viewing • Technical support provided by FacilityOT engineers	• Installs easily into any existing or new building in less than 60 minutes • Monitors different types of building systems via one centralized gateway • Integrates numerous types of sensors to deliver a consistent, unified data display • Eliminates onsite IT maintenance and upfront software costs • Requires no onsite computer or software installation/management • Uses any standard web browser for Windows, Apple, Android, and iPhone devices • Saves facility operational costs (e.g. utilities, food spoilage, leakages) • Improves building safety and security by monitoring occupancy, outdoor lighting, harmful vehicle emissions, etc. • Delivers the highest level of cloud service (Tier 4) • Runs economically with wireless sensor batteries that last 2-3 years • Enables automated corrective action based on machine learning (ML) techniques

Highlights

The following is a growing list of industry-first digital transformations achieved by our research and product development team:

- Exclusive plug-and-control architecture
- Edge-to-cloud connectivity
- Cloud-to-cloud connectivity
- Software/Network as a Service (SNaaS)
- Highly secure OT network, requiring no IT network connection
- Real-time intelligent notifications
- Enhanced reporting technology add-ons
- Carbon footprint reduction

Technical Support

FOT engineers install the pre-programmed box at your location(s), typically with a boilerplate setup for consistency at similar-type businesses. Operator permissions are set up with the first box, and more users added as more stores come online. User access can be customized, as needed, depending on role or job. Boxes may be shipped anywhere in the United States and installed by local technicians. Note that only authorized installers may configure the box and pre-bundled sensors. Ask about how the many features and sensors can be customized to fit your requirements. Afterward, the system is able to be troubleshot remotely by trained engineers should any problems arise, or alarms set off. This is all part of your package deal.

Summary

Digital cloud and sophisticated sensor technologies have finally come of age to feasibly offer automated facility operations to smaller businesses at a reasonable cost. FacilityOT North America has done its due diligence to create the most sensible, cost-effective, next-generation BAS that specifically targets this market niche. We believe that our sophisticated sensors, coupled with highly secure Internet connectivity and AI, have unlimited potential to make building systems more efficient than historically possible. And as IoT continues to mature, the seamless connection between machines, data, and humans will no doubt keep evolving.

The Future

With IoT, wireless sensors, and AI continuing to grow and dominate the world, there is an ever-increasing need for businesses to connect the physical and digital ecosystems with a “single pane of glass” user experience. The products and services discussed in this white paper are always improving, so you can expect to achieve greater operational proficiency, quicker reaction time to identify and solve problem areas, and increased staff productivity as time goes on—always dealing with just one vendor, on just one enterprise-level platform.

According to the March 2022 update of IoT Analytics’ Global IoT Enterprise Spending Dashboard, the IoT market size is forecast to expand at a Compound Annual Growth Rate (CAGR) of 22%, climbing to a valuation of USD 525 billion by the year 2027. An investment in our brand of emerging technology today pays off with immediate cost savings (a few thousand-dollar initial investment vs $20,000) and long-term

gains, by enabling future expansion with scalable monitoring and controlling abilities across a growing number of systems and buildings.

Join the forward-thinking companies and consider the many advantages of investing in wireless hardware, cloud computing, remote automation, AI, and other smart technologies to keep pace with your competitors, today and tomorrow.

To learn more, visit our website at www.fotcloudbas.com

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FacilityOT North America is the leader in groundbreaking operational technology that combines the IoT-BAS environment, the Cloud-BAS Gateway, and the FacilityOT Cloud. This engineered solution seamlessly and securely connects all OT components, while providing real-time reporting and alarms to inform accurate decision-making and quickly launch corrective actions.

Appendix A – Compatible Systems & Connection Types

The below table lists systems, by manufacturer, which are compatible with our open-source platform and next-generation architecture.

System	Manufacturer	Direct or Wireless Connections	Connects to Gateway Model(s)
HVAC Systems	• Carrier Corp. i-Vu Enabled Systems	Direct connection to Cloud-BAS Gateway	FOT-C FOT-C-IoT
HVAC Wall Thermostats/IAO Monitors	• Honeywell • JCI • Carrier BACnet Standard & Plus Wall Thermostats • Carrier Desktop IAQ Monitor	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
Makeup Air Systems	• Cambridge • Aaon • Greenheck	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
Dedicated Outside Air Systems (DOAS)	• Carrier Energy-X • Cambridge • Aaon • Greenheck • Petra	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
Interior and Exterior Lighting Control	• Nexus Lighting Control • Blue Ridge Technologies	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
IoT Sensors and Devices	• FOT Wireless Sensors • Belimo	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
VRF Systems	• Toshiba - Carrier	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
Gas Monitors	• Honeywell E3 Point • Graystone GDT Series • Belimo EXT	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT
Power Meters	• WattNode WNC • Siemens MD-BMS	Direct connection to Cloud-BAS Gateway	FOT-IoT FOT-C-IoT

Appendix B – Industry 4.0 Terminology

There are hundreds of concepts and terms that relate to Industry 4.0, but here are nine foundational words and phrases to know before you decide whether you want to invest in these advanced technology solutions for your business:

- **IoT:** IoT stands for Internet of Things, a concept that refers to connections between physical objects, like sensors or machines, and the Internet.
- **Big data:** Big data refers to large sets of structured or unstructured data that can be compiled, stored, organized, and analyzed to reveal patterns, trends, associations, and opportunities.
- **Artificial intelligence (AI):** Artificial intelligence refers to a computer's ability to perform tasks and make decisions that would historically require some level of human intelligence.
- **Digitization:** Digitization refers to the process of collecting and converting different types of information into a digital format.
- **Smart facility:** A smart facility is one that invests in and leverages Industry 4.0 technology, solutions, and approaches.
- **Cloud computing:** Cloud computing refers to the practice of using interconnected remote servers hosted on the Internet to store, manage, and process information.
- **Real-time data processing:** Real-time data processing refers to the abilities of computer systems and machines to continuously and automatically process data and provide real-time, or near-time, outputs and insights.
- **Ecosystem:** An ecosystem, in terms of building automation and monitoring, refers to the potential connectedness of your entire building's operational elements—with the proper technology, it will monitor and control your HVAC, lighting, water and power use, detect faults, advise and report on key components.
- **Cyber-physical systems (CPS):** Cyber-physical systems, also known as cyber manufacturing, refer to an Industry 4.0-enabled manufacturing environment that offers real-time data collection, analysis, and transparency across every aspect of operational technology.

Now that you have a better understanding of some of the core concepts related to Industry 4.0, you're ready to dig deeper into how "smart" devices can revolutionize the way you run and grow your business.